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TITLE OF THE THESIS : **Linear and Hyperbranched Polybenzyls and Poly(meta-phenylene)s**

ABSTRACT

A novel and clean method for synthesis of linear polybenzyls was developed. This involved polycondensation of electron rich 1,2,4,5-tertasubstituted benzenes with paraformaldehyde. By changing the nature and chain length of these substitutents a remarkable trend in molecular weights and thermal properties was observed. Some of the polymers exhibited the highest molecular weight ever reported for linear polybenzyls. The linear polybenzyls were studied as a possible precursor to poly(arylene methylene) by oxidizing one hydrogen radical in the benzyl carbon. Partial oxidation to conjugated forms was achieved. Hyperbranched polybenzyls were synthesized for the first time by appropriately designed AB_2 monomers and their properties were studied. Interestingly an A_2B monomer resulted in the formation of a calix[4]arene pointing to the efficacy of cyclic formation in these systems. Side reactions that are detrimental to polybenzyl synthesis in general were investigated. The peripheral functionalities of the hydrophobic hyperbranched polybenzyls was derivatized to hydrophilic PEG segments by melt transetherification reaction. The amphiphilicity of these core-shell molecules and gels were studied by several analytical techniques.

1,3-Dialkoxy substituted poly(meta-phenylenes) were synthesized by an oxidative coupling approach. The two side chains of each repeating unit terminated with a carboxylic acid moiety, rendering amphiphilic character to these otherwise hydrophobic polymers. The solution properties of these polymers were studied from a polysoap and foldamer angles as it was expected that the poly(meta-phenylene) backbone might adopt helical conformations. It was conclusively shown that some of these polymers indeed exhibit polysoap properties but whether the backbone folds into a time average stable helix remained inconclusive. Copolymers of anthracene and poly(meta-phenylene) were synthesized using the similar synthetic approach and were structurally characterized. These copolymers were studied as light emissive materials and it was shown that the emission in the blue region of the visible spectrum occurs from either diphenyl anthracene or bianthracene units in the backbone of these polymers by an energy funneling process.